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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BOYD, JENNIFER A	
ART UNIT	PAPER NUMBER
1771	

DATE MAILED: 02/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)
	10/034,296	STEPANIAN ET AL.
	Examiner	Art Unit
	Jennifer A Boyd	1771

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/23/04 has been entered. The Applicant's Amendments and Accompanying Remarks, filed 11/23/04, have been entered and have been carefully considered. Claims 1, 12, 16, 19, 34, 36, 38, 44 and 45 are amended and claims 1 – 48 are pending. In view of Applicant's amendments to claims 19 and 45 – 46, the Examiner withdraws the claim objections as detailed in paragraph 3 of the Office Action dated 5/28/04. In view of Applicant's amendments, the Examiner withdraws all previously set forth rejections as detailed in paragraphs 4 – 10 of the Office Action dated 5/28/04. Despite these advances, the invention as currently claimed is not found to be patentable for reasons herein below.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

3. Claims 1 – 4, 7 – 8, 11, 19, 21 – 25 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Frank et al. (US 2003/0077438).

Frank is directed to a composite aerogel material that contains fibers (Title).

As to claim 1, Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). The fibers can be in the form of wadding (page 2, [0020]). It should be noted that according to Merriam Webster Dictionary, "wadding" is defined as a soft mass or sheet of short loose fibers used for stuffing or padding. The Examiner equates the "wadding" to Applicant's "lofty fibrous batting". Frank notes that in the present invention the term "aerogel particles" is used to designate particles that are either monolithic, i.e. composed of one piece or aerogel particles that are joined by a binder or compressed to form a larger particle (page 2, [0032]). The monolithic aerogel particles are equated to Applicant's "aerogel monolith". Frank notes that the product of the present invention is mechanically stable, displays good acoustic dampening properties (insulating properties) and that the use of very fine fibers in the composite results in a flexible material (page 2, [0014] and [0022]).

As to claim 2, Frank teaches that the aerogels can be inorganic or organic (page 2, [0028]).

As to claim 3, Frank teaches that the aerogels can be based on Si or Al compounds (page 2, [0028]), which would encompass alumina and silica.

As to claim 4, Frank teaches that the aerogels can be melamine formaldehyde condensates or resorcinformaldehyde condensates (page 2, [0028]).

As to claim 7 - 8, Frank teaches that the composite can contain an iron oxide which is considered in the art to be a dopant (page 2, [0029]).

As to claim 11, Frank teaches that the preferred fibers have diameters that are between 0.1 μm and 1 mm (page 2, [0023]) and can be crimped (page 2, [0020]).

As to claim 19, Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). It should be noted that Frank teaches *at least one* fiber material, therefore, the reinforcing structure can contain more than one type of fiber. Frank teaches that the fibers can be natural fibers, synthetic, inorganic fibers such as glass, mineral, silicon carbide or carbon fibers (page 2, [0019]). In one embodiment, the reinforcing structure can contain carbon fibers and batting-type fibers such as natural or synthetic fibers. The fibers have diameters between 0.1 μm and 1 mm (1,000 μm) (page 2, [0023]). The fibers have a length greater than the mean diameter of the aerogel particles, therefore, they must be at least 0.5 mm (or 500 μm). It should be noted that the aspect ratio is the ratio between the length of a fiber and the diameter of the fiber. Using the parameters given by Frank, the aspect ratios will range from 0.5 – 5000, which satisfies the Applicant's requirement. The fibers can be in the form of wadding (page 2, [0020]). It should be noted that according to Merriam Webster Dictionary, "wadding" is defined as a soft mass or sheet of short loose fibers used for stuffing or padding. The Examiner equates the "wadding" to Applicant's "lofty fibrous batting". Frank notes that in the present invention the term "aerogel particles" is used to designate particles that are either monolithic, i.e. composed of one piece or aerogel particles that are joined by a binder or compressed to form a larger particle (page 2, [0032]). The monolithic aerogel particles are equated to Applicant's "aerogel monolith". Frank notes that the product of the present invention is mechanically stable, displays good acoustic dampening properties (insulating properties) and that the use of very fine fibers in the composite results in a flexible material (page 2, [0014] and [0022]).

As to claim 21 - 25, Frank teaches that carbon fibers can be used in the reinforcing structure. According to Applicant's Specification on page 15, the carbon fibers would resist sintering and reduces transmission of IR radiation more than the lofty fibrous batting. Additionally, carbon fibers are known in the art to attenuate radio frequency waves and electromagnetic waves.

As to claim 26, Frank teaches that mixtures of the types of fibers can be used (page 2, [0025]) implying that the material, size, aspect ratio or microfiber quantity can vary.

Claim Rejections - 35 USC § 102/103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5, 20, 27 – 28, 31 - 32, 38 – 40, 42 – 43 and 48 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Frank et al. (US 2003/0077438).

As to claim 5, Frank teaches that the composite is a mechanically stable material of very low thermal conductivity (page 2, [0018]). Frank lists that natural fibers such as cotton, cellulose and flax as fibers which are useful in the wadding material and that are known in the art to have low thermal conductivity.

As to claims 27 – 28 and 31, Frank teaches that a covering layer(s), equated to Applicant's "material having high thermal conductivity", can be attached to at least on side of

the composite (page 3, [0048]). Frank teaches that the covering layer(s) can be a metal film (page 4, [0049]). It is known in the art that a film is a type of sheet material and that a metal has high thermal conductivity.

As to claim 32, Frank teaches that a covering material can be applied on the top and/or bottom surface of the composite (page 3, [0048]); the top and bottom surfaces would be in the x-y plane of the composite.

As to claim 38, Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). The fiber material can be in the form of wadding (page 2, [0020]). It should be noted that according to Merriam Webster Dictionary, "wadding" is defined as a soft mass or sheet of short loose fibers used for stuffing or padding. Frank notes that in the present invention the term "aerogel particles" is used to designate particles that are either monolithic, i.e. composed of one piece or aerogel particles that are joined by a binder or compressed to form a larger particle (page 2, [0032]). The monolithic aerogel particles are equated to Applicant's "aerogel monolith". Frank teaches that the composite material can additionally contain a covering layer such as a metal films (page 4, [0049]). The Examiner equates the metal film to Applicant's "high thermal conductivity material". Frank notes that the product of the present invention is mechanically stable, displays good acoustic dampening properties (insulating properties) and that the use of very fine fibers in the composite results in a flexible material (page 2, [0014] and [0022]).

As to claim 39, Frank teaches that the covering layer can comprise a metal film (page 4, [0049]).

As to claim 42, Frank teaches that the covering layer(s) can be a metal film (page 4, [0049]). It is known in the art that a film is a type of sheet material.

As to claim 43, Frank teaches that a covering material can be applied on the top and/or bottom surface of the composite (page 3, [0048]); the top and bottom surfaces would be in the x-y plane of the composite.

As to claim 48, Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). It should be noted that Frank teaches *at least one* fiber material, therefore, the reinforcing structure can contain more than one type of fiber. Frank teaches that the fibers can be natural fibers, synthetic, inorganic fibers such as glass, mineral, silicon carbide or carbon fibers (page 2, [0019]). In one embodiment, the reinforcing structure can contain carbon fibers and batting-type fibers such as natural or synthetic fibers.

As to claims 5, 20, 38 and 40, although Frank does not explicitly teach the claimed fibers having a thermal conductivity of less than 50 mW/mK as required by claim 5, the microfibers are comprised of a material having a thermal conductivity below about 200 mW/mK as required by claim 20, the high thermal conductivity material has a thermal conductivity equal to or greater than 1 W/mK as required by claim 38 and high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 40, it is reasonable to presume that fibers having a thermal conductivity of less than 50 mW/mK as required by claim 5, the microfibers are comprised of a material having a thermal conductivity below about 200 mW/mK as required by claim 20, the high thermal conductivity material has a thermal conductivity equal to or greater

than 1 W/mK as required by claim 38 and high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 40 is inherent to Frank. Support for said presumption is found in the use of like materials (i.e. lofted batting with aerogel material and carbon microfibers) which would result in the claimed property. The burden is upon the Applicant to prove otherwise. *In re Fitzgerald* 205 USPQ 594. In addition, the presently claimed property of fibers having a thermal conductivity of less than 50 mW/mK as required by claim 5, the microfibers are comprised of a material having a thermal conductivity below about 200 mW/mK as required by claim 20, the high thermal conductivity material has a thermal conductivity equal to or greater than 1 W/mK as required by claim 38 and high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 40 would obviously have been present once the Frank product is provided. Note *In re Best*, 195 USPQ at 433, footnote 4 (CCPA 1977) as to providing of this rejection made above under 35 USC 102.

Claim Rejections - 35 USC § 103

6. Claim 6, 9 - 10, 12 – 18, 29 – 30 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frank et al. (US 2003/0077438).

Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). The fibers can be in the form of wadding (page 2, [0020]). It should be noted that according to Merriam Webster Dictionary, "wadding" is defined

as a soft mass or sheet of short loose fibers used for stuffing or padding. The Examiner equates the "wadding" to Applicant's "lofty fibrous batting". Frank notes that in the present invention the term "aerogel particles" is used to designate particles that are either monolithic, i.e. composed of one piece or aerogel particles that are joined by a binder or compressed to form a larger particle (page 2, [0032]). The monolithic aerogel particles are equated to Applicant's "aerogel monolith". Frank notes that the product of the present invention is mechanically stable, displays good acoustic dampening properties (insulating properties) and that the use of very fine fibers in the composite results in a flexible material (page 2, [0014] and [0022]).

As to claim 13, Frank teaches that the aerogels can be inorganic or organic (page 2, [0028]).

As to claim 14, Frank teaches that the aerogels can be based on Si or Al compounds (page 2, [0028]), which would encompass alumina and silica.

As to claims 6, 9 - 10, 12 and 17 - 18, Frank discloses the claimed invention except for the lofty batting has a sufficient quantity of fibers in its z axis to provide loft yet not so many that the insulating properties are compromised by the z axis fibers acting as thermal conduits as required by claim 6, the dopant is present in an amount of 1 – 20% by weight of the total composite as required by claim 9, the cross-sectional area of the fibers of the batting visible in a cross-section of the composite is less than 8% of the total surface area as required by claim 10 or less than 10% as required by claim 12 of that cross section, the batting has a density of about 0.1 to 16 lbs/ft^3 as required by claim 17 and the batting has a density of about 2.44 to 6.1 lbs/ft^3 as required by claim 18. It should be noted that the quantity of fibers, amount of dopant, cross-

sectional area of fibers visible and batting density are result effective variables. For example, as the quantity of fibers and density increases, the batting becomes more lofted. As the amount of dopant increases, conductivity increases. As the visible cross-sectional area increases, the properties of the batting changes. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the lofty batting has a sufficient quantity of fibers in its z axis to provide loft yet not so many that the insulating properties are compromised by the z axis fibers acting as thermal conduits as required by claim 6, the dopant is present in an amount of 1 – 20% by weight of the total composite as required by claim 9, the cross-sectional area of the fibers of the batting visible in a cross-section of the composite is less than 8% of the total surface area as required by claim 10 or less than 10% as required by claim 12 of that cross section, the batting has a density of about 0.1 to 16 lbs/ft^3 as required by claim 17 and the batting has a density of about 2.44 to 6.1 lbs/ft^3 as required by claim 18 since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In the present invention, one would have been motivated to optimize the density, amount of fibers in the z axis, level of dopant and surface area of fibers to create a composite with the proper level of conductivity and loft.

As to claims 15 – 17 and 29, although Frank does not explicitly teach the claimed batting is compressible by a minimum of 50% of its thickness and is sufficiently resilient that after compression for about 5 seconds it returns to at least 75% of its original thickness as required by claim 15, the fibrous batting is sufficiently lofty that it retains at least 50% of its thickness after addition of the gel forming liquid to form the aerogel monolith as required by claim 16,

compressible by at minimum of 65% and returns to at least 75% of its original thickness after compression for about 5 seconds as required by claim 17, and the high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 29, it is reasonable to presume that batting is compressible by a minimum of 50% of its thickness and is sufficiently resilient that after compression for about 5 seconds it returns to at least 75% of its original thickness as required by claim 15, compressible by at minimum of 65% and returns to at least 75% of its original thickness as required by claim 16 and 17, and the high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 29 are met by Frank. Support for said presumption is found in the use of like materials (i.e. a lofted batting with aerogel and low conductive fibers) which would result in the claimed properties. The burden is upon the Applicant to prove otherwise.

As to claims 30 and 41, Frank teaches that the covering layers can be made of metal films (page 4, [0049]). Frank fails to teach that the metal films can be made from copper or steel. It would have been obvious and necessary for one of ordinary skill in the art practicing the invention of Frank to provide the details of the metal film. As steel and copper are commonly known metals in the art which are malleable and have high thermal conductivity, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use steel or copper films in the invention of Frank, motivated by the expectation of successfully practicing the invention of Frank.

7. Claims 33 – 36 and 44 – 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frank et al. (US 2003/0077438) in view of Attey et al. (US 5,544,487).

Frank teaches the claimed invention above but fails to teach that the high thermal conductivity material conducts heat away from a localized heat load and emits it to the environment as required by claims 33 and 44, that the composite further comprises a heat sink, wherein the heat is emitted to the environment by means of a heat sink as required by claims 34 and 45, the high thermal conductivity material conducts heat way from a localized heat load to a process which uses the thermal energy directly as required by claims 35 and 46 and that the high thermal conductivity material conducts heat way from a localized heat load and into the device as required by claims 36 and 47.

Attey is directed to a thermoelectric system (Abstract). Frank teaches that a thermoelectrical module is a known type of heat pump in which the passage of an electric current through the module causes one side of the module to be cooled and the opposite side of the module to be heated. Thermoelectric modules are also known as Peltier modules or thermoelectric heat pumps (column 1, lines 10 – 20). Frank teaches that within the thermoelectric system there is a gap between the walls and surrounding the thermocouples (column 8, lines 1 – 7). Frank teaches that the gap may be filled preferably with an aerogel material to reduce the transfer of heat by conduction, convection and radiation between the hot and cold sides of the thermoelectric module (column 8, lines 5 – 15).

It would have been obvious to one of ordinary skill in the art to use the aerogel composite in conjunction with a heat sink as suggested by Attey motivated by the desire to reduce the

transfer of heat by conduction, convection and radiation between the hot and cold sides of the thermoelectric module. It should be noted that the use of the heat sink in conjunction with the aerogel composite of Frank would be capable of directing heat to a process which uses the thermal energy directly or a process which converts the thermal energy to electrical energy.

8. Claims 37 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frank et al. (US 2003/0077438) in view of Nishimura (JP 032135545A).

Frank teaches that all materials known to the practitioner skilled in the art are suitable for the covering layers. They can be porous covering layers such as porous films, papers, textile or non-woven fabrics that permit air to penetrate the material and thereby enhance its acoustic dampening properties (page 4, [0049]).

Frank fails to specifically teach that the covering layer or Applicant's "high thermal conductivity material" can comprise carbon fibers.

Nishimura teaches a mat of electrically conductive carbon fibers (Abstract). Nishimura teaches that the carbon fiber mat is useful in insulating applications (USE/ADVANTAGE).

Since Frank lacks disclosure to specific types of nonwoven materials useful as covering layers, it would have been necessary and thus obvious for one of ordinary skill in the art practicing the invention of Frank to look to the prior art as exemplified by 032135545A to provide the details of the non-woven covering layers. As carbon fiber mats are useful in insulating applications, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use carbon non-woven mats as the covering layers in the invention of Frank motivated by the expectation of successfully practicing the invention of Frank.

Response to Arguments

9. Applicant's arguments with respect to claims 1- 48 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A Boyd whose telephone number is 571-272-1473. The examiner can normally be reached on Monday thru Friday (8:30am - 6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on 571-272-1478. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer Boyd
Jennifer Boyd
February 1, 2005

CHERYL A JUSKA
PRIMARY EXAMINER